

Navigation Locks:

Item [37] **NUMBER:** Enter the number of existing navigation locks for the project.

Item [38] **LENGTH:** Enter to the nearest foot the length of the navigation lock.

Item [39] **WIDTH:** Enter to the nearest foot the width of the navigation lock.

Item [40] thru [45] Enter the lengths and widths of additional locks.

LINE 6:

Item [46] **OWNER:** Enter name of owner. Abbreviate as necessary.

Item [47] **ENGINEERING BY:** Enter name of organization that engineered the main dam structure. Abbreviate as required.

Item [48] **CONSTRUCTION BY:** Enter name of construction agency responsible for construction of main structure. Abbreviate as required.

LINE 7:Regulatory Agency:

Item [49] **DESIGN:** Enter the name of the organization other than the owner having regulatory or approval authority over the design of the dam. If no organization other than the owner has regulatory or approval authority over the design of the dam indicate NONE.

Item [50] **CONSTRUCTION:** Enter the name of the organization other than the owner having regulatory authority or inspection responsibilities over the construction of the dam. If no organization other than the owner has regulatory authority or inspection responsibilities over the construction of the dam indicate NONE.

Item [51] **OPERATION:** Enter the name of the organization other than the owner having regulatory authority, operational control, or surveillance responsibilities over the operation of the dam. If no organization other than the owner has regulatory authority, operational control or surveillance responsibilities over the operation of the dam indicate NONE.

Item [52] **MAINTENANCE:** Enter the name of the organization other than the owner having regulatory authority or inspection or surveillance responsibilities over the maintenance of the dam. If no organization other than the owner has regulatory authority or inspection or surveillance responsibilities over the maintenance of the dam indicate NONE.

LINE 8:Inspection:

Item [53] **BY:** Enter the name of the organization that performed the last safety inspection. Abbreviate as required. If no inspection has been performed enter NONE.

Item [54] **DATE:** Enter the one (1) or two (2) digits for day, the first three (3) letters of the month and a two (2) digit year when the inspection was performed. If not applicable, leave blank.

Item [55] **AUTHORITY FOR INSPECTION:** Enter the legislative or regulatory authority for performing the inspection indicated in item 53, e.g., P.L. 92-367; Div 3, Water Code, State of Calif; F.R. 1110-2-100; etc.

LINE 9:

Item [56] **REMARKS:** Preface remarks with the item number to which it pertains. e.g., 34.2, 500,000 c.y. conc. 475,000 c.y. earthfill. Only one Remarks line should be used for PART II remarks.

EXHIBIT 2

APPENDIX C TO § 222.6—HYDROLOGIC AND
HYDRAULIC ASSESSMENT OF DAMS

1. Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses of dam and reservoir capabilities. However, when such analyses are available, they should be evaluated for reliability and completeness. If a project's ability to pass the appropriate flood (see Table 3, page D-12 of Recommended Guidelines) can be determined from available information of a brief study, such an assessment should be made. It should be noted that hydrologic and hydraulic analyses connected with the Phase I inspections should be based on approximate methods or systematized computer programs that take minimal effort. The Hydrologic

Engineering Center (HEC) has developed a special computer program for hydrologic and hydraulic analyses to be used with the Phase I inspection program. Other Field Operating Agencies have developed similar computer programs or generalized procedures which are acceptable for use. All such efforts should be completed with minimum resources.

2. A finding that a dam will not safely pass the flood indicated in the Recommended Guidelines does not necessarily indicate that the dam should be classified as unsafe. The degree of inadequacy of the spillway to pass the appropriate flood and the probable adverse impacts of dam failure because of overtopping must be considered in making such classification. The following criteria have

been selected which indicate when spillway capacity is so seriously inadequate that a project must be classified as unsafe. All of the following conditions must prevail before designating a dam unsafe:

a. There is high hazard to loss of life from large flows downstream of the dam.

b. Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

c. The spillway is not capable of passing one-half of the probable maximum flood without overtopping the dam and causing failure.

3. The above criteria are generally adequate for evaluating most non-Federal dams. However, in a few cases the increased hazard potential from overtopping and failure is so great as to result in catastrophic consequences. In such cases, the evaluation of condition 2c should utilize a flood more closely approximating the full probable maximum flood rather than one-half the flood. An example of such a situation would be a large dam immediately above a highly populated flood plain, with little likelihood of time for evacuation in the event of an emergency.

4. Conditions 2a and 2b require an approximation of housing location in relation to flooded areas. Resources available in Phase I inspections do not permit detailed surveys or time-consuming studies to develop such relationships. Therefore, rough estimates will generally be made from data obtained during the inspection and from readily available maps and drawings. Brief computer routings such as the HEC-1 dam break analysis, using available data, are recommended in marginal cases. The HEC-1, dam break version, is available on the Boeing Computer Services or may be obtained from the Hydrologic Engineering Center, Davis, California. Available resources do not permit detailed studies or investigations to establish the amount of overtopping that would cause a dam to fail, as designated in condition 2c. Professional judgment and available information will have to be used in these determinations. When detailed investigations and studies are required to make a reasonable judgment of the conditions which designate an unsafe dam, the inspection report should recommend that such studies be the responsibility of the dam owner.

5. During the inspection of a dam, consideration should be given to impacts on other dams located downstream from the project

being inspected. When failure of a dam would be likely to cause failure of another dam(s) downstream, its designation as an unsafe dam could result in multiple impacts. Therefore, the information should be explicitly described in the inspection report. Such information may be vital to the priorities established by State Governors for dam improvements. Similarly, when the failure of an upstream dam (classified as unsafe) could cause failure of the dam being inspected, this information should be prominently displayed in the inspection report.

6. The criteria established in paragraph 2 for designating unsafe dams because of seriously inadequate spillways are considered reasonable and prudent. They provide a consistent bases for declaring unsafe dams and also serve as an effective compromise between the Recommended Guidelines and unduly low standards suggested by special interests and individuals unfamiliar with flood hazard potential.

7. The Hydrometeorological Branch (HMB) of the National Weather Service has reviewed some 500 experienced large storms in the United States. The purpose of the review was to ascertain the relative magnitude of experienced large storms to probable maximum precipitation (PMP) and their distribution throughout the country. Their review reveals that about 25 percent of the major storms have exceeded 50 percent of the probable maximum precipitation for one or more combinations of area and duration. In fact some storms have very closely approximated the PMP values. Exhibits C-1 thru C-5 indicate locations where experienced storms have exceeded 50 percent of the PMP.

8. There are several options to consider when selecting mitigation measures to avoid severe consequences of a dam failure from overtopping. The following measures may be required by a Governor when sufficient legal authority is available under State laws and a dam presents a serious threat to loss of life.

a. Remove the dam.

b. Increase the height of dam and/or spillway size to pass the probable maximum flood without overtopping the dam.

c. Purchase downstream land that would be adversely impacted by dam failure and restrict human occupancy.

d. Enhance the stability of the dam to permit overtopping by the probable maximum flood without failure.

e. Provide a highly reliable flood warning system (generally does not prevent damage but avoids loss of life).

TABLE 1—STORMS WITH RAINFALL ≥150% OF PMP, U.S. EAST OF THE 105TH MERIDIAN (FOR 10 MI², 6 HOURS; 200 MI², 24 HOURS AND/OR 1,000 MI², 48 HOURS)

Storm date	Index No.	Corps assignment No. (if available)	Storm center		Latitude	Longitude
			Town	State		
July 26, 1819	1	.....	Catskill	NY	42°12'	73°53'
Aug. 5, 1843	2	.....	Concordville	PA	39°53'	75°32'
Sept. 10–13, 1878	3	OR 9–19	Jefferson	OH	41°45'	80°46'
Sept. 20–24, 1882	4	NA 1–3	Paterson	NJ	40°55'	74°10'
June 13–17, 1886	5	LMV 4–27	Alexandria	LA	31°19'	92°33'
June 27–July 11, 1899	6	GM 3–4	Turnersville	TX	30°52'	96°32'
Aug. 24–28, 1903	7	MR 1–10	Woodburn	IA	40°57'	93°35'
Oct. 7–11, 1903	8	GL 4–9	Paterson	NJ	40°55'	74°10'
July 18–23, 1909	9	UMV 1–11B	Ironwood	MI	46°27'	90°11'
July 18–23, 1909	10	UMV 1–11A	Beaulieu	MN	47°21'	95°48'
July 22–23, 1911	11	.....	Swede Home	NB	40°22'	96°54'
July 19–24, 1912	12	GL 2–29	Merrill	WI	45°11'	89°41'
July 13–17, 1916	13	SA 2–9	Altapass	NC	35°33'	82°01'
Sept. 8–10, 1921	14	GM 4–12	Taylor	TX	30°35'	97°18'
Oct. 4–11, 1924	15	SA 4–20	New Smyrna	FL	29°07'	80°55'
Sept. 17–19, 1926	16	MR 4–24	Boyden	IA	43°12'	96°00'
Mar. 11–16, 1929	17	UMV 2–20	Elba	AL	31°25'	86°04'
June 30–July 2, 1932	18	GM 5–1	State Fish Hatchery	TX	30°01'	99°07'
Sept. 16–17, 1932	19	.....	Ripogenus Dam	ME	45°53'	69°09'
July 22–27, 1933	20	LMV 2–26	Logansport	LA	31°58'	94°00'
Apr. 3–4 1934	21	SW 2–11	Cheyenne	OK	35°37'	99°40'
May 30–31, 1935	22	MR 3–28A	Cherry Creek	CO	39°13'	104°32'
May 31, 1935	23	GM 5–20	Woodward	TX	29°20'	99°28'
July 6–10, 1935	24	NA 1–27	Hector	NY	42°30'	76°53'
Sept. 2–6, 1935	25	SA 1–26	Easton	MD	38°46'	76°01'
Sept. 14–18, 1936	26	GM 5–7	Broome	TX	31°47'	100°50'
June 19–20, 1939	27	.....	Snyder	TX	32°44'	100°55'
July 4–5, 1939	28	.....	Simpson	KY	38°13'	83°22'
Aug. 19, 1939	29	NA 2–3	Manahawkin	NJ	39°42'	74°16'
June 3–4, 1940	30	MR 4–5	Grant Township	NB	42°01'	96°53'
Aug. 6–9, 1940	31	LMV 4–24	Miller Isl	LA	29°45'	92°10'
Aug. 10–17, 1940	32	SA 5–19A	Keysville	VA	37°03'	78°30'
Sept. 1, 1940	33	NA 2–4	Ewan	NJ	39°42'	75°12'
Sept. 2–6, 1940	34	SW 2–18	Hallet	OK	36°15'	96°36'
Aug. 28–31, 1941	35	UMV 1–22	Haywood	WI	46°00'	91°28'
Oct. 17–22, 1941	36	SA 5–6	Trenton	FL	29°48'	82°57'
July 17–18, 1942	37	OR 9–23	Smethport	PA	41°50'	78°25'
Oct. 11–17, 1942	38	SA 1–28A	Big Meadows	VA	38°31'	78°26'
May 6–12, 1943	39	SW 2–20	Warner	OK	35°29'	95°18'
May 12–20, 1943	40	SW 2–21	Nr. Mounds	OK	35°52'	96°04'
July 27–29, 1943	41	GM 5–21	Devers	TX	30°02'	94°35'
Aug. 4–5, 1943	42	OR 3–30	Nr. Glenville	WV	38°56'	80°50'
June 10–13, 1944	43	MR 6–15	Nr. Stanton	NB	41°52'	97°03'
Aug. 12–15, 1946	44	MR 7–2A	Cole Camp	MO	38°40'	93°13'
Aug. 12–16, 1946	45	MR 7–2B	Nr. Collinsville	IL	38°40'	89°59'
Sept. 26–27, 1946	46	GM 5–24	Nr. San Antonio	TX	29°20'	98°29'
June 23–24, 1948	47	.....	Nr. Del Rio	TX	29°22'	100°37'
Sept. 3–7, 1950	48	SA 5–8	Yankeetown	FL	29°03'	82°42'
June 23–28, 1954	49	SW 3–22	Vic Pierce	TX	30°22'	101°23'
Aug. 17–20, 1955	50	NA 2–22A	Westfield	MA	42°07'	72°45'
May 15–16, 1957	51	.....	Hennessey	OK	36°02'	97°56'
June 14–15, 1957	52	.....	Nr. E. St. Louis	IL	38°37'	90°24'
June 23–24, 1963	53	.....	David City	NB	41°14'	97°05'
June 13–20, 1965	54	.....	Holly	CO	37°43'	102°23'
June 24, 1966	55	.....	Glenullin	ND	47°21'	101°19'
Aug. 12–13, 1966	56	.....	Nr. Greely	NB	41°33'	98°32'
Sept. 19–24, 1967	57	SW 3–24	Falfurrias	TX	27°16'	98°12'
July 16–17, 1968	58	.....	Waterloo	IA	42°30'	92°19'
July 4–5, 1969	59	.....	Nr. Wooster	OH	40°50'	82°00'
Aug. 19–20, 1969	60	NA 2–3	Nr. Tyro	VA	37°49'	79°00'
June 9, 1972	61	.....	Rapid City	SD	44°12'	103°31'
June 19–23, 1972	62	.....	Zerbe	PA	40°37'	76°31'
July 21–22, 1972	63	.....	Nr. Cushing	MN	46°10'	94°30'
Sept. 10–12, 1972	64	.....	Harlan	IA	41°43'	95°15'
Oct. 10–11, 1973	65	.....	Enid	OK	36°25'	97°52'

Corps of Engineers, Dept. of the Army, DoD

§ 222.6

TABLE 2—STORMS WITH RAINFALL $\geq 50\%$ OF PMP, U.S. WEST OF CONTINENTAL DIVIDE (FOR 10 MI² 6 HOURS OR 1,000 MI² FOR ONE DURATION BETWEEN 6 AND 72 HOURS)

Storm date	Index No.	Storm center		Latitude	Longitude	Duration for 1,000 mi ²
		Town	State			
Aug. 11, 1890	1	Palmetto	NV	37°27'	117°42'	.....
Aug. 12, 1891	2	Campo	CA	32°36'	116°28'	.....
Aug. 28, 1898	3	Ft. Mohave	AZ	35°03'	114°36'	.....
Oct. 4-6, 1911	4	Gladstone	CO	37°53'	107°39'	.....
Dec. 29, 1913-Jan. 3, 1914	5	.....	CA	39°55'	121°25'	.....
Feb. 17-22, 1914	6	Colby Ranch	CA	34°18'	118°07'	.....
Feb. 20-25, 1917	7	.....	CA	37°35'	119°36'	.....
Sept. 13, 1918	8	Red Bluff	CA	40°10'	122°14'	.....
Feb. 26-Mar 4, 1938	9	.....	CA	34°14'	117°11'	.....
Mar. 30-Apr. 2, 1931	10	.....	ID	46°30'	114°50'	24
Feb. 26, 1932	11	Big Four	WA	48°05'	121°30'	.....
Nov. 21, 1933	12	Tatoosh Is	WA	48°23'	124°44'	.....
Jan. 20-25, 1935	13	.....	WA	47°30'	123°30'	6
Jan. 20-25, 1935	14	.....	WA	47°00'	122°00'	72
Feb. 4-8, 1937	15	Cyamaca Dam	CA	33°00'	116°35'	.....
Dec. 9-12, 1937	16	.....	CA	38°51'	122°43'	.....
Feb. 27-Mar. 4, 1938	17	.....	AZ	34°57'	111°44'	12
Jan. 19-24, 1943	18	.....	CA	37°35'	119°25'	18
Jan. 19-24, 1943	19	Hoegee's Camp	CA	34°13'	118°02'	.....
Jan. 30-Feb. 3, 1945	20	.....	CA	37°35'	119°30'	.....
Dec. 27, 1945	21	Mt. Tamalpais	CA	37°54'	122°34'	.....
Nov. 13-21, 1950	22	.....	CA	36°30'	118°30'	24
Aug. 25-30, 1951	23	.....	AZ	34°07'	112°21'	72
July 19, 1955	24	Chiatovich Flat	CA	37°44'	118°15'	.....
Aug. 16, 1958	25	Morgan	UT	41°03'	111°38'	.....
Sept. 18, 1959	26	Newton	CA	40°22'	122°12'	.....
June 7-8, 1964	27	Nyack Ck	MT	48°30'	113°38'	12
Sept. 3-7, 1970	28	.....	UT	37°38'	109°04'	6
Sept. 3-7, 1970	29	.....	AZ	33°49'	110°56'	6
June 7, 1972	30	Bakersfield	CA	35°25'	119°03'	.....
Dec. 9-12, 1937	31	.....	CA	39°45'	121°30'	48

ER 1110-2-106
2.6 Sept 79

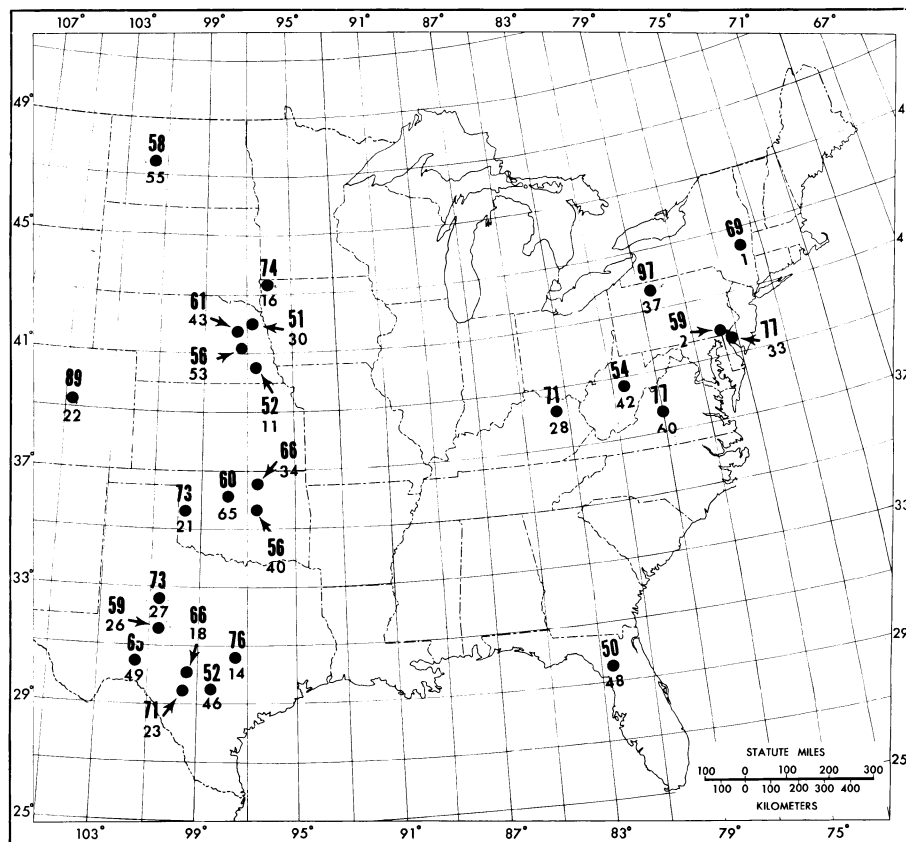


Plate 1: Observed point rainfalls $\geq 50\%$ of all-season PMP, U.S. east of 105th meridian for 10 mi² 6 hours. (Large number is % of PMP, small number is storm index, see table 1.)

Exhibit C-1

ER 1110-2-106'
26 Sept 79

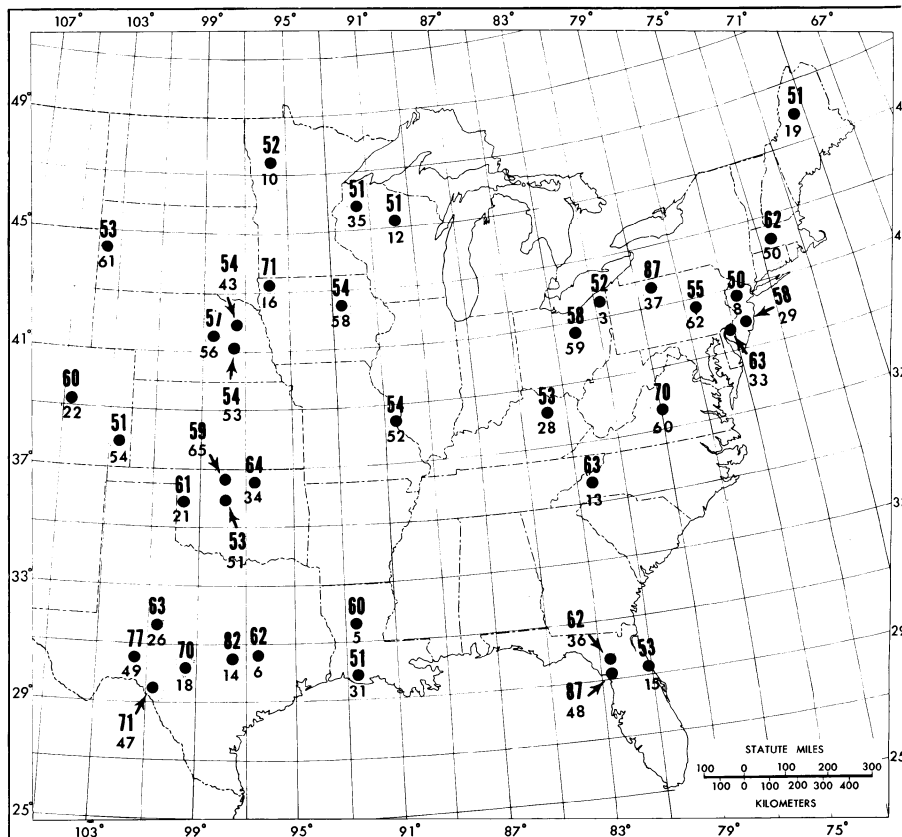


Plate 2: Observed 24 hour rainfalls $\geq 50\%$ of all-season PMP, U.S. east of 105th meridian for 200 mi² 24 hours. (Large number is % of PMP, small number is storm index, see table 1.)

Exhibit C-2

ER 1110-2-106
26 Sept 79

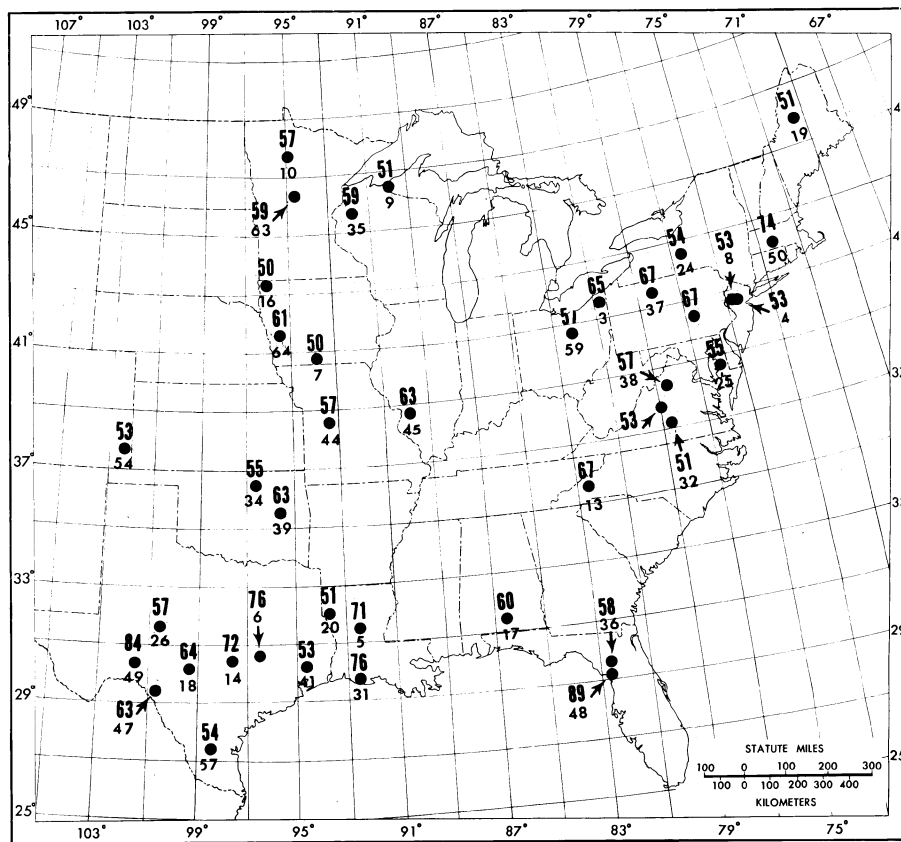


Plate 3: Observed rainfalls $\geq 50\%$ of all-season PMP, U.S. east of the 105th meridian for 1000 mi² 48 hours. (Large number is % of PMP, small number is storm index, see table 1.)

Exhibit C-3

ER 1110-2-106
26 Sept 79

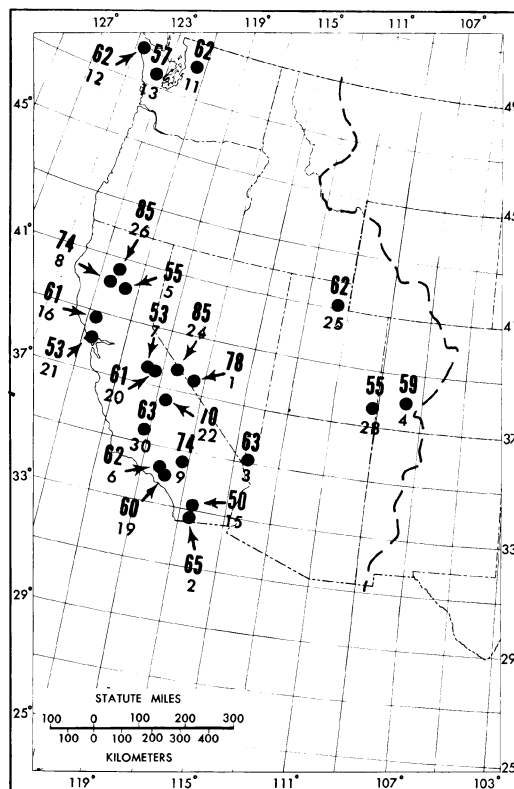


Plate 4: Observed point rainfalls $\geq 50\%$ of all-season PMP, U.S. west of the Continental Divide for 10 mi² for 6 hours. (Large number is % of PMP. Small number is storm index, see table 2.)

Exhibit C-4

ER 1110-2-106
20 Sept 79

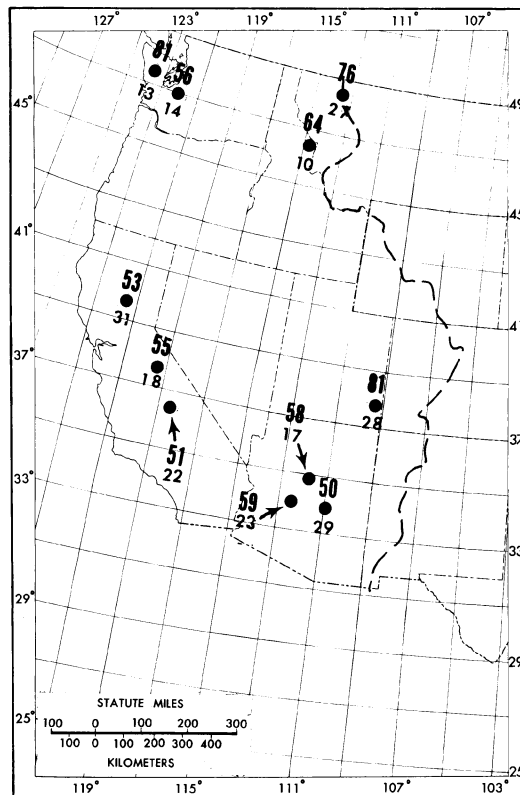


Plate 5: Observed rainfalls $\geq 50\%$ of all-season PMP, U.S. west of the Continental Divide for 1000 mi² for one duration between 6 and 72 hours. (Large number is % of PMP. Small number is storm index, see table 2.)

Exhibit C-5